What is claimed is:

- 1 1. A system comprising:
- 2 a source of substantially spin-polarized electrons; and
- a medium which interacts with the spin-polarized electrons, the medium including
- 4 a spin-dependent quantum well and a layer of semi-conductor material capable of
- 5 emitting photons.
- 1 2. The system of claim 1, wherein the layer of semi-conductor material comprises a layer
- 2 of N-type semi-conductor and a layer of P-type semi-conductor coupled so as to form a
- 3 P-N junction.
- 1 3. The system of claim 2, wherein the P-N junction comprises an electron excited light-
- 2 emitting structure.
- 1 4. The system of claim 3, wherein the layer of semi-conductor material comprises
- 2 Gallium-Arsenic (GaAs).
- 5. The system of claim 4, wherein the spin-dependent quantum well is substantially
- 2 opaque to the photons emitted, during operation, by the layer of semi-conductor material.
- 1 6. The system of claim 1, wherein the spin-dependent quantum well comprises a layer of
- 2 layer of magnetic material sandwiched between a first and second layers of spin mirror
- 3 materials.
- 7. The system of claim 6, further including:
- a first layer of a electrically conductive material between the first layer of spin
- 3 mirror material and the layer of hard magnetic material; and,

- a second layer of electrically conductive material below the layer of semi-
- 5 conductor material.
- 1 8. The system of claim 7, wherein the second layer of electrically conductive material is
- 2 substantially thin to allow photons emitted, during operation, by the layer of semi-
- 3 conductor material to pass through the second layer of electrically conductive material.
- 9. The system of claim 7, wherein the second layer of electrically conductive material, at
- 2 least partially, reflects the photons emitted, during operation, by the semi-conductor
- 3 material.
- 1 10. A method for reading the spin state of a magnetic domain comprising:
- directing at the magnetic domain a beam of electrons substantially polarized in a
- 3 particular spin state; and
- 4 detecting the light emission state of a semi-conductor layer of the magnetic
- 5 domain.
- 1 11. The method of claim 10, wherein detecting the light emission state comprises
- 2 capturing at least a portion of the emitted photons utilizing a sensitive photo-detector.
- 1 12. The method of claim 10, further comprising determining the state of the magnetic
- 2 domain, based in, part upon the light emission state.
- 13. The method of claim 12, wherein determining the state of the magnetic domain
- 2 comprises comparing the spin state of the beam of electrons to the light emission state of
- 3 the semi-conductor layer.

- 1 14. The method of claim 12, further comprising trapping a portion of the beam in the
- 2 magnetic domain.
- 1 15. The method of claim 14, wherein determining the state of the magnetic domain
- 2 comprises determining what the state of the magnetic domain was prior to trapping a
- 3 portion of the beam in the magnetic domain.
- 1 16. A system for reading data comprising:
- 2 a source of spin polarized electrons;
- a storage medium disposed a selected distance from the source and having a
- 4 plurality of storage locations, each storage location including a magnetic material and a
- 5 layer of semi-conductor material capable of emitting photons; and
- a photo-detector to detect the emitted photons.
- 1 17. The system of claim 16, wherein the magnetic material of the storage location
- 2 includes a spin-dependent quantum well.
- 1 18. The system of claim 16, wherein the layer semi-conductor material of the storage
- 2 location includes a P-N junction.
- 1 19. The system of claim 16, wherein the layer semi-conductor material of the storage
- 2 location includes Gallium-Arsenic (GaAs).
- 1 20: The system of claim 16, further comprising a vacuum housing.
 - 1 21: The system of claim 20, wherein the vacuum housing is at least partially reflective,
- 2 so as to facilitate the integration of the emitted photons.

- 1 22: The system of claim 16, wherein the magnetic material of the storage location is
- 2 substantially opaque to the photons emitted, during operation, by the layer of semi-
- 3 conductor material.
- 1 23. A storage structure comprising:
- 2 an array of magnetic locations, each magnetic location including a hard magnetic
- 3 material sandwiched in between a first and second layer of a spin-mirror material and a
- 4 layer of semi-conductor material.
- 1 24. The storage structure of claim 23, wherein the layer of semi-conductor material
- 2 includes a P-N junction.
- 1 25. The storage structure of claim 24, wherein the P-N junction comprises an electron
- 2 excited light emitting structure.
- 1 26. The storage structure of claim 23, wherein the layer of semi-conductor material
- 2 includes a direct-band semiconductor.
- 1 27. The storage structure of claim 26, wherein the layer of semi-conductor material
- 2 includes Gallium-Arsenic (GaAs).
- 1 28. The storage structure of claim 23, wherein each magnetic location further includes a
- 2 layer of electrically conductive non-magnetic metal.
- 1 29. The storage structure of claim 28, wherein the layer of electrically conductive non-
- 2 magnetic metal is substantially thin to allow the photons emitted, during operation, by the

- 3 layer of semi-conductor material to substantially pass through the conductive, non-
- 4 magnetic metal.
- 1 30. The storage structure of claim 23, wherein the layer of hard magnetic material and
- 2 the first and second layer of a spin-mirror material are substantially opaque to the photons
- 3 emitted, during operation, by the layer of semi-conductor material.

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